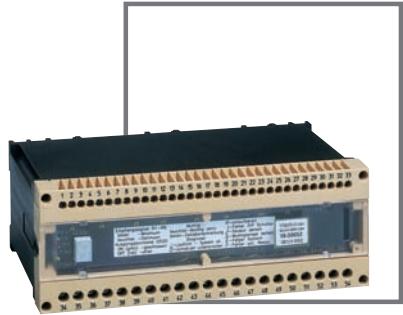


MANUAL

SC4-8 CONTROL UNIT



With regard to the supply of products, the current issue of the following document is applicable: The General
Terms of Delivery for Products and Services of the Electrical Industry,
published by the Central Association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V."
including the supplementary clause: "Erweiterter Eigentumsvorbehalt".

Part No. 113113
Date of issue 2012-03

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Introduction!

These operating instructions provide information on the intended use of the product and are intended to prevent the occurrence of dangerous situations. They must be read and applied by all persons involved in the application, installation, operation, servicing, repair and inspection of the product. This product can only fulfil the purpose for which it is intended if it is installed, operated, serviced, repaired and inspected in accordance with the information provided by Pepperl+Fuchs.

The guarantee provided by Pepperl+Fuchs for this product is rendered null and void if the product is not installed, operated, serviced, repaired and inspected in accordance with the information provided by Pepperl+Fuchs.

Before the selection and use of the product, an evaluation must be undertaken to determine that it is suitable for the envisaged application. Pepperl+Fuchs has no control over the selection and use of the product. Our liability is therefore restricted to the intrinsic quality of the product.

The product must be regularly inspected and serviced by specialist personnel. The results of such inspections and servicing operations are to be recorded. Only original Pepperl+Fuchs parts are to be used when effecting repairs.

Modifications to the equipment or components and the use of defective or incomplete equipment or components are not permitted. Repair work on equipment or components carried out other than by Pepperl+Fuchs must only be undertaken in proper workshop facilities. Such workshop facilities are responsible for acquiring the latest technical information on the equipment and components from Pepperl+Fuchs.

Repair work on the product, which has not been carried out by Pepperl+Fuchs, is outside the control of Pepperl+Fuchs. Our liability is therefore restricted to those repairs that have been carried out by Pepperl+Fuchs.

The statements above do not replace the clauses relating to guarantees and liability in the

Pepperl+Fuchs general terms and conditions of sale and supply.

This equipment contains assemblies that are electrostatically sensitive. Opening of the equipment for the purpose of servicing and repair work must be undertaken by specialist personnel. Electrostatic discharges due to unprotected contact with the assemblies must be avoided. The destruction of components caused by an electrostatic discharge will render the guarantee null and void!

The right is reserved to make technical changes.

Symbols

In this manual important notes for operation and safety when using the control unit SL4-8 are distinguished by symbols. The meaning of the symbols are:



Recommendation for the user


Attending these notes the installation procedure and the use of the control unit SLC4-8 will be lightened.



Indication of dangerous circumstances or a direct danger. Non observance may lead to damage to property, or to severe or fatal injury.


1 Declaration of Conformity

This product was developed and manufactured under observance of the applicable European standards and guidelines.

	A corresponding Declaration of Conformity may be requested from the manufacturer.
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Pepperl+Fuchs GmbH in D-68301 Mannheim has a certified quality assurance system in conformity with ISO 9001.



	Applied harmonized standards are listed in Chapter technical data
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2 Designated Use

The SC4-8 is a control unit for a category 4 (EN ISO 13849-1) or type 4 (EN IEC 61496) safety light barrier system with 1 to 8 single-path light barriers (consisting of a transmitter and a receiver). The SC4-8 control unit can be combined with SLA single-path light barriers, SLP light grids, muting sensors and/or other user-selectable safety devices to form a modular protection system. This system is designed for the following applications only:

- As an electro-sensitive protection system to safeguard danger spots or danger zones against entry.
 - As a switching device for contact monitoring.
 - As a switching device for evaluating the signals of other safety switching equipment.
- If used for any other purpose, the designated function of the system is no longer guaranteed. The applicable safety regulations, standards and requirements should be observed in all use of the equipment, taking account of the specific requirements applying to the use in question.

An SC4-8-based protection system can e.g. be used as a perimeter access system for palletising systems, robots, high-bay warehouses and machinery.

The following components can be connected to the SC4-8 control unit as required:

- Between one and eight SLA single-path light beam switches or
- SLP light grid with 2, 3 or 4 light beams.
- Up to four (under certain conditions up to 8) muting sensors for implementing muting modes.
- Emergency Stop
- 2-channel category 4 safety equipment as per EN ISO 13849-1
- Light curtain SLC
- Control unit with rating IP 20 / NEMA 1, assigned for mounting in a control cabinet or in an enclosure with a rating of at least IP 54 / NEMA 3

2.1 Operating Principle

Each optoelectric transmitter creates a beam of light which is registered by a corresponding receiver. Several light beams make up a protection zone. If a beam of light is interrupted, the SC4 control unit registers this, and the OSSD outputs switch to OFF. Depending on the type of light beam switches used, the protective light beams can be up to 65 m in length.

Muting sensors can be used to bypass protective light beams under certain defined conditions. While in muting mode, a bypassed protection beam can be interrupted without the OSSD outputs being switched to OFF.

Emergency Stop and other 2-channel safety devices are connected to inputs for which a simultaneity condition has been defined. If this condition is violated (e.g. by a defective channel of the connected safety device) the system will go into safe mode.

The start/restart interlock prevents switching on again after a system start or when the OSSD outputs have been switched off. Following operation of a potential separating N/C contact connected to the control unit, the OSSD outputs are switched back on, provided the light beams are not interrupted.

When the control unit registers an error, it goes into safe mode. The OSSD outputs are switched off and the display shows the detected error. To exit this mode, operate an N/C contact connected to the reset terminal or switch off the operating voltage, wait for 5 s and then switch it back on. Independently of error states, operating the reset can be used to trigger a restart, which includes a test of the entire system, including the OSSD outputs.

Emergency muting is an operating mode enabling the user under certain safety conditions to switch the OSSD outputs back on, even though the light beams are still interrupted. To do this, operate the inputs for reset and start-up enable at the same time (single switch/key).

At another input, muting can be disabled by closing a potential separating contact. This disabling function is not monitored. It can be used for machine protection, but should not be used to protect people.

3 System Characteristics

- Customer-specific configuration due to memory module.
- Self-monitoring.
- 1 to 8 protective beams.
- Up to 4 muting sensors.
- Emergency muting to allow removal of jammed material.
- Can be operated with or without start/restart interlock.
- On-going monitoring of switching operations of an external N/C contact.
- Red transmitter light for easy alignment of light beams.
- Operating reserves indicator on the optoelectric receivers and on the control unit.
- Contamination indicator.
- Diagnostic display for easy localisation of faults.
- Easy to integrate into the machine control system.
- OSSD outputs: changeover contacts for monitored, positively driven relays, or alternatively electrically isolated solid state outputs.

4 Configuring the SC4-8

The SC4-8 is a safety switching device that can be configured to perform a customer-defined function. This function is specified by means of a clip-on memory module.



This memory module is programmed and supplied only by the SC4-8 manufacturer.

The memory module is used to define the following settings:

- Start/restart interlock (on/off).
- Monitoring an external contact (on/off).
- Deactivation of channels not required.
- Time-window-limited muting.
- Light-beam-limited muting.
- System for bidirectional/unidirectional dynamic muting.
- Separate definition of channels 5 to 8 as muting channels.
- Definition of the combination of muting sensors for muting activation.
- Definition of the safety light beams that will be affected by muting.
- Muting time window of up to 240 s.
- Emergency muting time window of up to 30 s.
- Deactivation delay for muting channels: delays from 0 to 240 s are possible. (The specified amount of time can be allocated to the muting channels individually. The amount

of time will be the same for all the muting channels that have a deactivation delay allocated to them. The deactivation delay can be retriggered.)

- Simultaneity conditions for channel pairs: For channel pairs 1-2, 3-4, 5-6 and 7-8 it is possible to specify that their status (activated or deactivated) has to be the same within a defined time tolerance. The time tolerance can be set from 0 to 30 s.
- Inversion of each sensor channel.
- Sensor type selection: system-type sensors (i.e. operating in line with the system's pulse specification) and non-system-type sensors. For the protection beams, only system-type sensors are permitted.
- Reaction time delay of up to 1.2 s (to suppress signals from fast-moving objects).
- 62 ms to 16 s monitoring window for the monitored external contact.
- Time of up to 240 s to trigger an alarm in the event of lack of operating reserves for a sensor channel.

The following signals can be placed on up to 3 potential separating outputs: "Error occurred", "Start-up process completed" (approx. 2 s after system start), "Not enough operating reserves", "Muting activated", "System ready for start-up".

The "Muting activated" signal may only be placed on the current-monitored output 47-48.

5 Components of the Safety Light Barrier System

The figure 5.1 shows a schematic drawing of the system. The SC4-8 control unit generates the necessary supply voltages for the light barriers, activates the optoelectric transmitters and evaluates the signals sent by the receivers. In the muting modes, up to four muting sensors (under certain circumstances, up to 8) are connected instead of light barriers 5 to 8.

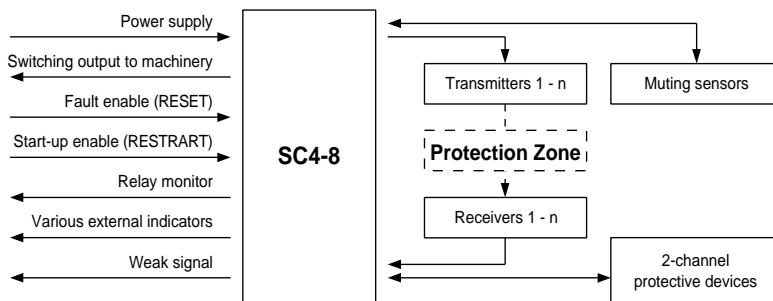


Figure 5.1: Schematic of the safety system

The connections on the SC4-8 control unit are made by screw clamps. The connections are identified in figure 5.2.

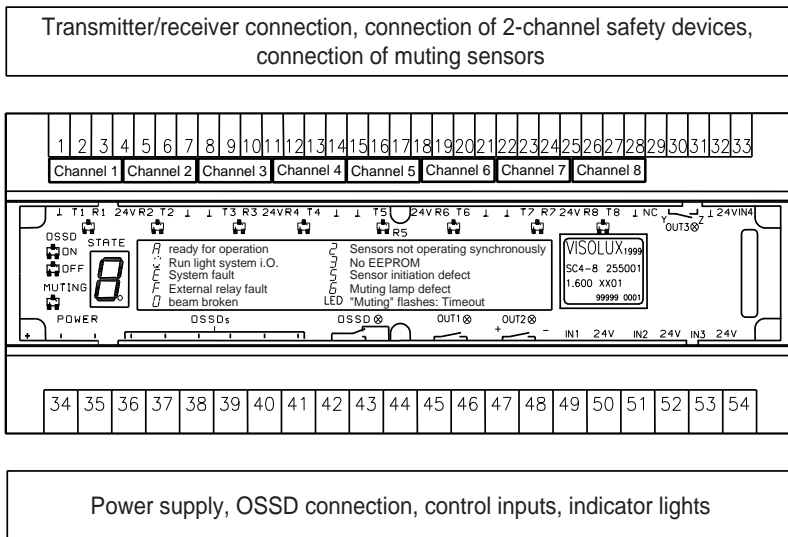


Figure 5.2: Power supply, OSSD-connection, control inputs, indicator lights



*The light barriers and muting sensors are operated using extra-low voltage.
For the specific wiring of individual control units, refer to the data sheet
included in the packaging.*

6 Setting up and Installing the Protection Zone Light Barriers

Light barriers connected to the same control unit cannot interfere with one another.

Light barriers connected to different control units should be arranged in such a way that the transmitters of one light barrier group are not pointing towards the receivers of the other light barrier group.

It is possible to combine light barrier types as required, provided that they are authorised for use with the SC4-8.

The light barriers must be arranged in such a way that no one can reach the dangerous area by bypassing the light barrier.

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It must not be possible:

- To crawl through under the lowest beam.
- To reach across the uppermost beam.
- To slip through between two beams.

The light barriers should be mounted in such a way that they can be adjusted by moving and rotating the housing.

To calculate the minimum distance between the light barriers and the danger area, please refer to the applicable regulations and standards. Based on EN ISO 13855, the minimum distance can be calculated as follows:

$$S = C \cdot T + A$$

where

S = Minimum safety distance in mm, i.e. distance between danger area and protection zone.

C = Constant in mm/s for the speed of approach.

T = Total response time in s,

$$T = t1 + t2$$

t1: 40 ms response time of the protective device

t2: Machine response time

A = Additional distance in mm; this depends on how far someone can penetrate the danger zone before the protective device is triggered.

For the height of individual beams running parallel to the ground, EN ISO 13855 recommends the following values:

No. of beams	Height above reference level/mm
1	750
2	400, 900
3	300, 700, 1100
4	300, 600, 900, 1200
5	Lowest beam \leq 300 Highest beam \geq 900
6	
7	
8	

Table 6.1: Position of individual beams in vertical arrangements



Note that reflective objects which could lead to the beam being reflected around an obstacle must be kept away from the transmission and/or reception cones (EN IEC 61496-2).

7 Connection of 2-channel Protection Devices

7.1 Configuring the SC4-8

In order to recognise the failure of a channel of the connected safety device, the SC4-8 enables the user to define simultaneity conditions for pairs of sensor inputs. If the SC4-8 detects a difference between the two channels, it goes into locked mode and the OSSD outputs are switched off.

To tolerate timing differences between the two protection channels, a time window is defined for the selected simultaneity pairs. The time windows specified can range from 0.5 s to 30 s.

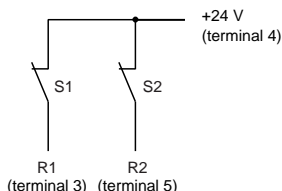
Safety devices with potential separating output contacts can be connected in such a way that they either switch a DC voltage on or off at the signal inputs (system-external operation) or make or break the connection between transmitter outputs and the corresponding signal inputs of the SC4-8 (system-internal operation) - see Section 7.2.

It must be defined whether the SC4-8 should switch on or off when a contact is made. This definition can be different for each output pair. It is also possible to define anti-coincidence operation for the two outputs of a pair.



If Emergency-Stop-Switches (EN 418) are attached, the Start-up/Re-start interlock mode must be activated to prevent from start-up, when the Emergency-Stop-Switch is unlocked.

7.2 Safety devices with potential separating output contacts



Type 1:

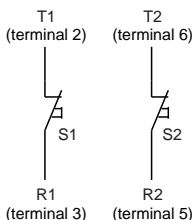
The potential separating output contacts switch a DC voltage at the sensor inputs.

The pair R1-R2 is given as an example. Instead of the N.C. contacts, it is also possible to use N.O. contacts.

The contacts are subjected to a current load of approx. 24 V/10 mA.

Cross-connections between R1 and R2 cannot be detected. For this reason, the corresponding cables have to be reliably protected against crushing, e.g. by routing them through a protected cable duct or an armoured conduit.

Figure 7.1: Connection of potential separating contacts via +24 V



Type 2:

The potential separating output contacts make or break connections between transmitter outputs and the corresponding signal inputs.

The contacts are only subjected to short pulses with a voltage of 10 V and a current of approximately 5 mA.

The cables do not have to be protected, since any cross-connections between the cables will be detected.

Figure 7.2: Connection of potential separating contacts between transmitter output and signal input

The two above-mentioned types of connection have the following properties:

Simultaneity pair	Sensor channel
1	1 and 2
2	3 and 4
3	5 and 6
4	7 and 8

Tabelle 7.1: Simultaneity pairs

Simultaneity pair	Terminal		
	contact 1	contact 2	+ 24 V
1	3	5	4
2	10	12	11
3	17	19	18
4	24	26	25

Table 7.2: Connection of potential separating contacts via +24 V

Simultaneity pair	Terminal			
	S1.1	S1.2	S2.1	S2.2
1	2	3	6	5
2	9	10	13	12
3	16	17	20	19

Table 7.3: Connection of potential separating contacts between transmitter output and signal input

At frequent intervals, the correct function of the solid state outputs in the protection devices is verified by means of short switching operations. This creates short signal pulses with a duration in the order of microseconds. The individual bursts of these test pulses should be shorter than 0.8 ms, and the interval between the bursts should exceed 5 ms in order to ensure trouble-free signal evaluation by the SC4-8.

7.3 Protection Devices with Monitored Solid state Outputs

Solid state outputs can be connected directly if they support active switching to high level. The connection of npn outputs requires a pull-up resistor.

If the connected safety device protects the outputs against short-circuits and cross-connections, the cables can be routed without any special protection; otherwise, the cables must be routed in such a way that they are protected against crushing.

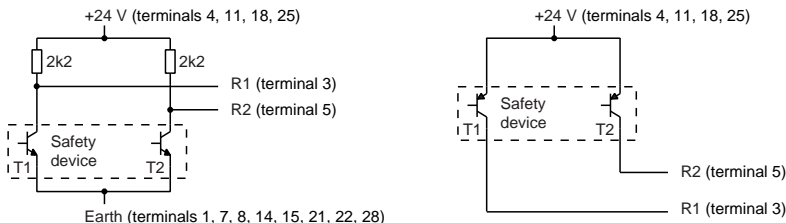


Figure 7.3: Protection device with npn-outputs/with pnp-outputs.

8 Muting

The following section is only relevant if the user plans to use the muting function.

The muting modes allow the protection zone to be bypassed as required by the system's designated function.

The SC4-8 allows category 4 muting (2 independent muting sensors tripped in order to trigger muting) or category 2 muting (1 muting sensor tripped in order to trigger muting) as defined by EN IEC 61496-1. When using category 2 muting, the corresponding protection zone is downgraded to category 2.

In order to be able to move an object through the protection zone without causing the protection zone to respond, muting sensors with a sensing range extending both in front of and behind the protection zone are required. The sensors must be arranged in such a way that the object which triggers muting is continuously sensed by at least 2 muting sensors while passing through the protection zone.

With its deactivation delay for muting channels, the SC4-8 offers, in conjunction with protection-beam-limited muting, the possibility of using a unilateral arrangement of muting sensors. In this case, the deactivation delay is defined in such a way that the object that initiates muting will have left the protection zone within this time period.

Muting requires the connection of a signal lamp with an area of at least 1 cm² and a brightness of 200 cd/m². This signal lamp is monitored by the SC4-8. If in a system with muting the lamp is disconnected or defective, the system reverts to safe mode.

The muting mode is reached approximately 115 ms after the muting sensors have been tripped. The system terminates the muting mode approximately 10 ms after deactivation of the muting sensors.

The spatial arrangement of the muting sensors must ensure that muting can only be initiated by the objects to be moved into the area and not by people. The arrangement of the muting sensors depends on the following circumstances:

- Specific application.
- Type of muting sensors used.
- Number of muting sensors.
- Way in which the objects are moved into the danger area.
- Type and size of the objects to be passed through.
- Speed at which the objects move.
- Safety considerations to ensure that the muting sensors cannot be "fooled".

8.1 Dynamic Muting



In dynamic muting, the use of a signal lamp is not obligatory. Since the standard at most establishes an indirect link between dynamic operation and category 2, decisions as to the applicability of dynamic muting should be taken by the relevant professional association.

Muting is also possible using so-called dynamic operation (as defined by EN 415-4, Appendix A.2.1.: Packaging Machine Safety). This does not involve the use of muting sensors. In dynamic operation, muting is initiated when 3 protection beams are interrupted in a pre-defined sequence (see figure 8.1).

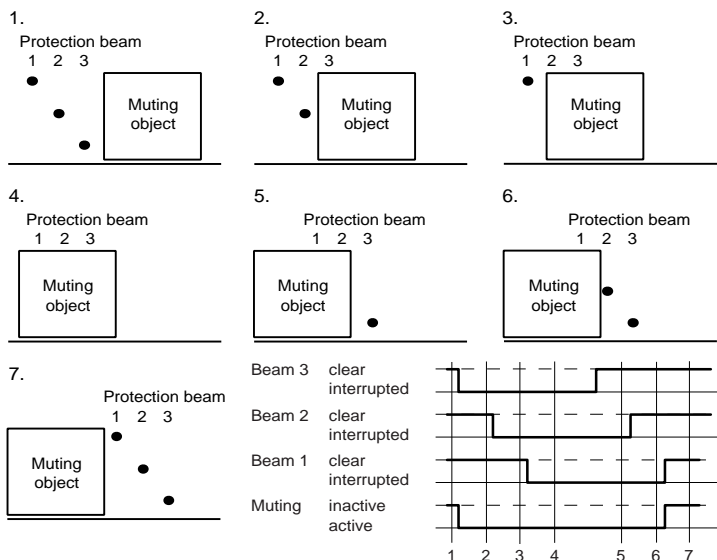


Figure 8.1: Dynamic muting

8.2 Time-window-limited and Protection-beam-limited Muting

Muting using muting sensors can be configured as time-window-limited or protection-beam-limited muting.

In time-window-limited muting, the activation of a muting sensor becomes invalid once the pre-set monitoring period has elapsed (muting time window), and an existing muting condition is terminated. This is described as muting timeout.

In protection-beam-limited muting, time is counted as long as no relevant protection beam has been interrupted. If at least 1 relevant protection beam is interrupted, the time count stops. The system can remain in this condition indefinitely; there will be no muting timeout. When all beams of the protection zone are clear again, all the associated muting channels will, after a pre-defined delay, go into timeout. The muting condition is then terminated.

An existing muting timeout can only be cancelled by deactivating the relevant muting channels.

Muting safety can be increased by defining a simultaneity condition for muting sensor pairs. The simultaneity tolerance can be set to values between 0.5 s and 30 s.

Any deviation from this sequence will lead to the OSSD outputs being switched off.

9 Muting with the Safety Light Curtain SLC

The SLC is a safety light curtain without a muting function. By combining a SLC with a SC4-8 control unit, a conventional bypass (Muting) of the protection fields is achieved. In this arrangement, in principle, all the functions of the SC4-8 remain available:

- With/without restart inhibit
- With/without contactor control
- Single muting
- Double muting
- Sequential/parallel muting
- In-circuit or no in-circuit light barriers as muting sensors

The SLC is connected with its two OSSDs to the inputs channel 1 (R1, terminal 3) and channel 2 (R2, terminal 5) of the SC4-8. Optionally, a second SLC for double muting or a 2-channel emergency-off contact can be connected to channel 3 (R3, terminal 10) and channel 4 (R4, terminal 12). However, double muting requires a separate data set. If no emergency-off is required, terminals 10 (R3) and 12 (R4) must be jumpered with terminal 11 (24 V).

The muting sensors are connected to channels 5 – 8 (T5 – T8 and R5 – R8).

Switching off the unsafe device is achieved via two changeover contacts or, optionally, two semiconductor outputs on the SC4-8. It should be noted that the reaction times of the SLC and the SC4-8 are additive. For this application we therefore recommend the SLC with the faster semiconductor outputs.

The SLC is to be operated **without** start/restart inhibits. A separate data set has to be created for each SC4-8 application. A typical configuration is shown here.

- With start/restart interlock, startup is enabled via an external N.C. contact between terminals 51 and 52 (start enable).
- With contactor control, the limiting time for the external contact monitoring is 200 ms.
- The protection field (SLC) is to be connected with both its OSSD – outputs to the inputs channel 1 (R1, terminal 3) and channel 2 (R2, terminal 5) of the SC4-8. The voltage supply for the potentially isolated semiconductor OSSDs on the SLC is provided from the SC4-8 (terminals 1 and 4).
- A 2-channel emergency-off contact can be connected on channel 3 (R3, terminal 10) and channel 4 (R4, terminal 12). If an emergency-off is not required, terminals 10 (R3) and 12 (R4) are connected with terminal 11 (24V).
- Sequential muting (no simultaneity condition) with a maximum of 4 muting sensors on channels 5 – 8 (T5 – T8 and R5 – R8). The muting sensors are external to the system, i.e. they have a pnp output (active when object is detected, level 10 V ... 30 V) or via a potential-free N.O. contact that is supplied with 24 V from SC4-8.
- The muting is limited to a time window of 240 s duration.
- With the muting inhibit, a N.O. contact between terminals 32 and 33 enables the muting function inhibit.

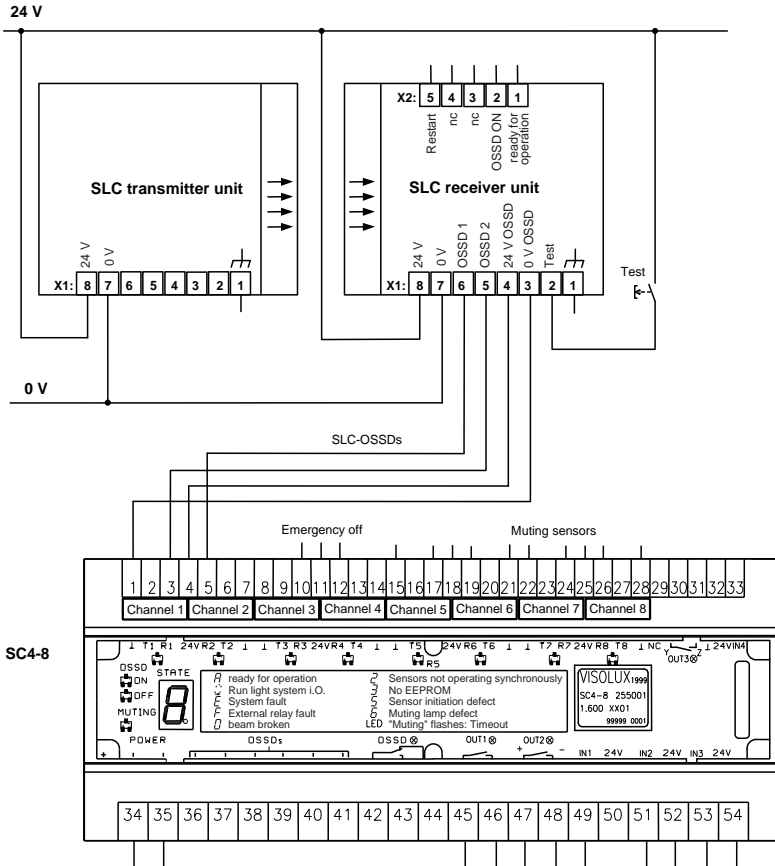


Bild 9.1: Connection of the SLC to the SC4-8 Muting Unit. (The double muting, muting sensors and muting lamp are not represented)

10 Installing/Removing the Control Unit

To mount the unit, a standard 35 mm DIN rail as per DIN EN 50 022-35 should be attached to the surface upon which the control unit will be fitted. The housing material on the underside of the unit includes a profile and a spring-loaded locking device. The SC4-8 control unit is placed with its underside against one edge of the DIN rail and clipped on using the locking device. To remove the unit, use a screwdriver to push back the locking device and lift off the unit. Leave enough room above the screw clamp terminals to allow screwdriver access.

11 Installation and Function of the System Components

Connect the system components to the control unit once the light barriers, muting sensors and SC4-8 control unit have been fitted.

SLA light barrier	SLP light grid	Condition
green	on	Light beam clear, operating reserves at least a factor of 1.5
yellow	flashing	Light beam clear, operating reserves less than a factor of 1.5
off	off	Light beam interrupted

Table 11.1: Light barrier/light grid indicator lights

11.1 Light Barriers

Connect the optoelectronic transmitters and receivers to the SC4-8 control unit as indicated by the colour coding or the terminal designations shown in the diagram on the data sheet.

The receivers are equipped with an indicator light that shows the reception status (see Table 11.1).

11.2 Light Grids

SLP light grids should be connected to the SC4-8 as per the instructions shown on the data sheet.

The receiver profiles are equipped with a red LED above the cable entry. This LED indicates readiness for operation.

Each receiver has a red LED which signals the reception status (off/flashing/on).

For interpretation of the LED signals please refer to Table 11.1.

11.3 Muting Sensors

The muting sensors should be connected to the SC4-8 as indicated on the data sheet. With non-system-type sensors, the control unit does not perform an assessment of the operating reserves. In cases where the control unit has to supply power to non-system-type muting sensors, the maximum permissible no-load current for each sensor is 20 mA.

11.4 Connection Cables

The length of the connection cables between the sensors and the control unit must not exceed 50 m. The cables to the light barriers must be selected such as to eliminate the possibility of a short circuit between the receiver and transmitter lines. For relay outputs, the interconnection of connections OSSD 1 and 2 has to be configured such that short-line faults cannot lead to the relay contacts being jumpered. The dielectric strength must be selected to ensure reliable separation. OSSD solid state outputs are protected against short circuits and cross-connections.

11.5 External Indicator Lights for Connection to the Potential Separating Outputs

The external indicator lights that can be connected are not included with the unit. To connect external indicator lights to the SC4-8, refer to the instructions on the data sheet. To signalise start-up readiness, use the signal colour yellow. When choosing the indicator light for muting mode, note the specified minimum requirements for brightness and surface area (see Section 8).

If the muting indicator light runs on DC voltage, take the polarity into account. The conditions "on" and "off" of the OSSD outputs must be indicated by the colours green and red, respectively.

11.6 Electrical Safety

If supplied with mains voltage, the control unit is designed to ensure reliable separation between the voltage supply terminals 34 and 35 and all the other terminals.

If the OSSD outputs are relays, OSSD terminals 36 to 41 are designed to ensure reliable separation if the unit is supplied with mains voltage. If the OSSD outputs are semiconductors, the OSSD outputs are electrically isolated from the other terminals, but separation is not ensured.



For this reason, solid state outputs must not be connected to low voltage (as per low voltage directive 2006/95/EG) or high voltage, but must only be connected to protective low voltage circuits.

The potential separating output terminals 42 to 48 are designed to ensure reliable separation from the other terminals under low-voltage conditions. However, these terminals are not designed to ensure reliable separation from each other.



Hence it is not permissible to connect some of these terminals to protective low voltage while connecting others to low or high voltage.

The terminals 29 and 30 represent a potential separating relay output which must not be operated using low voltage.

11.7 Supply Voltage

Connect the unit to its appropriate supply voltage as indicated in Table 11.2. The unit, OSSD and muting light may be supplied by a single source.

Unit (terminals 34-35)	Operating voltage	
	SC4-8 24V	24 V AC/DC; with DC, polarity is irrelevant
	SC4-8 115V	115 V AC
	SC4-8 230V	230 V AC
	SC4-8-2479	24 V DC, ensure correct polarity: 34 to +, 35 to -
OSSD (terminals 36-37)	Only for solid state OSSDs (SC4-8-2479) 12 V ... 30 V DC, ensure correct polarity: 36 to +, 37 to -	
Muting light (terminals 47-48)	Supplies the muting light, only required if muting mode is used 20 V ... 230V AC or DC, ensure correct polarity with DC: 47 to +, 48 to -	

Table 11.2: SC4-8 operating voltages

11.8 OSSD Outputs

11.8.1 Relays

The potential separating changeover contacts of the two positively driven relays for connection to devices located downstream in the machinery control system (e.g. contactor relays), are located at terminals 36 to 38 (OSSD 1) and 39 to 41 (OSSD 2).

In the case of inductive loading of the output contacts, they have to be protected against the resultant increased stress by fitting RC combinations or free-wheeling diodes. The circuit must be set up directly on the piece of equipment in question.



When using free-wheeling diodes, note that the drop-out time of the connected relays or contactors is increased.

The permitted switching capacity as stated in Section 18 must be observed if the outputs are used for switching DC loads.

When the control unit is integrated into the safety control system of the machine, the instructions given in EN IEC 61496-1 must be observed, among others (interface connection of the control elements located downstream of the electro-sensitive protection device).



The output contacts of the relays are not monitored for short circuits or cross-connections. This should be taken into consideration in wiring and cable routing.

If the output relays remain switched on continuously for a very long period of time, switching capability should be tested at least once a day. To do this, interrupt the protection zone or trigger a system reset using the reset input (see Section 11.9.1).

11.8.2 Solid State Output

The control unit and OSSDs may be supplied separately, in which case they are electrically isolated. The outputs actively switch high and actively switch low. The outputs are protected against short circuits and cross-connections.

In case of integration into an equipment control system, note that continuous self-testing will cause pulses with a width of 80 μ s to appear at the outputs. In "off" condition these are high pulses, otherwise they are low pulses. For the electrical data please refer to Section 18.

11.9 External Control Contacts

External control contacts should be potential separating contacts positioned between the respective input and a 24 V output. The current load when closed is approximately 8 mA when supplied with nominal voltage.

The inputs' function depends on the implemented configuration and is indicated on the data sheet. There follows a description of the functions allocated to the inputs.

11.9.1 Fault Enable (Reset)

The reset function (terminals 49, 50) is triggered by opening an N.C. contact connected to the appropriate input for 0.05 ... 1 s before closing it again. The reset function resets the system to the start-up status. It takes approximately 2 s before the system is ready to operate again. The reset function can also be triggered by switching the operating voltage off for approximately 5 s. It is used in the following situations:

- To test the switching capability of the output relays.
- To clear an error state.

11.9.2 Start-up Enable (Restart)

The start-up enable (terminals 51, 52) is triggered by opening an N.C. contact connected to the appropriate input for 0.05 ... 1 s before closing it again. If readiness for start-up has been established and the start/restart interlock is active, the start-up enable has the effect of switching on the OSSD outputs. If the system is operated without start/restart interlock, this input is not wired.

11.9.3 Emergency Muting

If the muting sensors are in timeout condition (indicated by a flashing muting status indicator on the control unit), then no regular muting is possible with these muting sensors, even though a muting condition (see Section 8) may be fulfilled. The emergency muting function enables the user in such a situation to activate muting for a limited time period. To activate this function, reset and restart have to be triggered simultaneously. The time limit for emergency muting is defined by the configuration. The default is 4 s. Emergency muting can be re-triggered by repeating the same process.

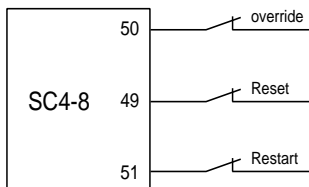


Figure 11.1: Connection of the Override, Restart and Reset buttons

11.9.4 Relay Monitor

This section is only relevant if the system has been configured for monitoring an external contact.

The SC4-8 can monitor externally connected N.C. contacts, if their function is connected with the switching of OSSD outputs. Such contacts may belong to contactors controlled by the unit or to other parts of the system (e.g. follow-up detection). If the external contact does not correspond to the status of the OSSD outputs for longer than the set monitoring time, the system goes into an error state (error F). The monitoring time can be set to any value up to 30 s, with a precision of approximately 62 ms.

An example is contactor monitoring as illustrated in Figure 8. This shows serial connection of two contactor contacts belonging to different contactor units.

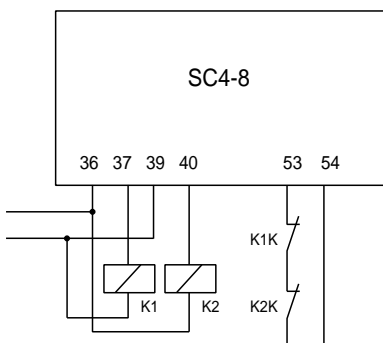


Figure 11.2: Relay monitor



When switching low voltage or high voltage through the monitored switching elements, the relevant electrical safety regulations must be observed.

12 Function Indicator

12.1 Indicator LEDs on the Front Panel of the SC4-8

The front panel on the top side of the housing as shown in figure 5.2 includes several LEDs for displaying various operating states and a 7-segment numerical display for diagnostic states.

The yellow LEDs R1-R8 show the receive status of the connected light barriers or muting sensors:

- Status on (yellow): Light beam clear with reliable reception and at least 1.5-fold operating reserves.
- Status flashing (yellow): Light beam clear with 1 to 1.5-fold operating reserves.
- Status off: Light beam interrupted or the level is below the response threshold.

Display showing the status of the output relays (OSSD):

- Green light: Output on.
- Red light: Output off.

Display for muting status (MUTING):

- Status on (yellow): System operation with muting.
- Status flashing (yellow): Time limit exceeded by a muting sensor (see Section 8 for more information on muting timeout).
- Status off: System operation without muting.

12.2 7-segment Display for Operational States and Error States (STATE)

- A: SC4-8 is ready and waiting for the start-up enable (only if a start-up/restart interlock is in effect).
- Circling light: Enable received for start-up, the protection zone is clear, the light circles in a clockwise direction.
- 0: Interruption of one or more beams of light, the protection zone is not clear. The yellow R1 to R8 LEDs indicate which light beams have been interrupted.
- 2: Violation of a simultaneity condition.
- 3: Memory module missing or defective.
- 5: Transmitter drive circuit failed.
- 6: Muting light missing or defective.
- E: General control unit error.
- F: Fault in the external relay or contactor.

Part No. 113113

14.3.12

Date of issue

13 Start-up

Once the supply voltage has been switched on, the SC4-8 control unit runs through its start-up test, and the light barriers are activated.

13.1 Adjustment

A red transmitter light is used to facilitate adjustment of the light barriers.

The adjustment procedure begins with the transmitter. The red light is directed towards the point where the receiver is located. This is done either by observing the red light by looking into the transmitter (not dangerous) or by fitting a retro-reflector to the receiver's location and observing it from the transmitter's position. Note that you must look with your eye close to the axis of the beam. Once the transmitter has been adjusted, the receiver should be aligned so the indicator LED indicates reliable reception with at least 1.5-fold operating reserves (steady green or red light).

13.2 Testing the Detection Capability of the Installed Electro-sensitive Protection Device

The following steps have to be performed in order to verify the detection capacity:

- Remove all objects from the paths of the beams.
- Interrupt the light beams one after the other; the device should then switch to off status.

13.3 Testing the Start-up/restart Interlock and Start-up Enable

- Interrupt a beam and then remove the obstruction(s) from all beams.
- The output relays must remain blocked if the start-up interlock is active, and the indicator light for start-up readiness must light up.
- Operate the start-up enable contact for 0.05 s ... 1 s (RESTART).
- The output relays must switch on and the indicator for start-up readiness must switch off.

13.4 Testing the Fault Enable Connection (RESET)

- Remove all objects from the paths of the beams.
- If a start-up interlock is active, operate the start-up enable contact (RESTART).
- The output relays must switch on.
- Operate the fault enable contact (RESET) for 0.05 s ... 1 s.
- The output relays must switch off.

13.5 Testing the Relay Monitor

- Interrupt the connection between external contact and control unit.
- Switch the SC4-8 unit on.
- Check the operating/error state display on the SC4-8. If it displays **F**, then the contact monitor is active.
- Re-connect the interrupted line.

13.6 OSSDs in Operation

The two OSSDs are switched on under the following conditions:

- With start-up interlock active: The light beams are clear and start-up is enabled.
- Without start-up interlock: The light beams are clear.

The OSSDs remain switched on under the following conditions:

- No light beam is interrupted.
- Muting is active while light beams are interrupted.

The OSSDs are switched off under the following conditions:

- The light beams are interrupted.
- The light beams are interrupted while muting is active, but timed out.
- An error state is recognised.
- The fault enable contact (RESET) is operated.

13.7 Testing the connected 2-channel Safety Devices

- Operate the safety device; the SC4-8 must switch to off and must not indicate an error (7-segment display must show "0").

14 Periodic Testing

Periodic testing is required if the OSSD outputs of the control unit are relays and there is no guarantee that:

- there is at least one interruption of the protection zone each day
- or the unit is switched on once every operating day.

The test is performed as follows:

- Clear protection zone and enable start-up.
- Interrupt a beam of the protection zone at random and at the same time observe the indicator for the OSSD outputs. This must switch from green to red.
- The test is completed if the control unit does not enter into an error state.

15 Fuses

If the control unit's OSSD outputs are relays, then each relay is protected by T2A safety fuses.

Solid state outputs have electronic protection.

The 47-48 output is protected by a T1A safety fuse.

Always disconnect the control unit from the power supply prior to exchanging a fuse. To change fuses, remove the lower terminal strip (34-54). The location of the fuses is shown in figure 15.1.

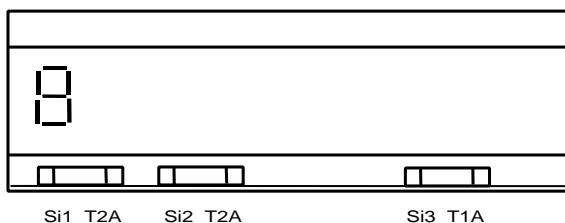


Figure 15.1: Location of the fuses

16 Troubleshooting

Faults in the system always lead to the system going over to the safe interlocked status. The outputs are then switched off. A fault will cause the system to enter an error state identified by an error display (error code). This is helpful for troubleshooting.

There follows a list of some faults that can be corrected by the user:

Fault	Activity
Control unit's indicator lights do not light up	Check power supply
Indicator lights at the potential separating outputs do not light up	Check installation and external power supply, in addition check fuse at output 47-48
Start-up enable (RESTART) does not work, display shows code A	Check the connection between the SC4-8 control unit and the external NC contact
An output cannot be switched	Check the fuses on terminals 36-38 (OSSD1) or 39-41 (OSSD2) with start-up enabled. Replace the fuses if necessary and check the installation
No object in the protection zone, but display shows code 0	Check the operating reserve indicator on the light barriers and the control unit to establish if a light beam has been interrupted. If necessary, re-adjust the light barriers or check the installation
Display shows error code 2	Check emergency cut-out switch or connected 2-channel safety device
Display shows error code 3	Replace memory module
Display shows error code 5	Check transmitter installation
Display shows error code 6	Connect muting light or replace defective muting light or check installation of muting light
Display shows error code E	Operate fault enable contact (RESET) or switch the operating voltage off and on again. Check if light from another light barrier is disrupting one of the connected receivers
Display shows error code F	Check the monitored contact components and the connection cables

Table 16.1: Troubleshooting

17 Application Checklist

The application checklist is used as a tool to help avoid mistakes when setting up the safety light barrier system.

17.1 Prior to Installation

- Have you complied with the appropriate standards (see Section 19)?
- Have you got the SC4-8 control unit and the correct types and required quantity of light barriers?
- Does the SC4-8 have the required operating voltage? (Refer to the rating plate.)
- Do the output connections and the electrical power supply connections achieve the overvoltage category required by EN 50178 relative to the other connections?
- If using the external contact monitoring function: Is safe separation as per overvoltage category 4 (EN 50178) ensured between the monitoring N.C. contact and other contacts?
- If using muting: Do the muting sensors you have meet the defined specifications, and have you got the required quantity?
- If using muting: Is there a suitable muting indicator available with the prescribed level of brightness?
- Is there enough room above the screw clamp terminal blocks of the SC4-8 for installation and removal?
- Is the SC4-8 installed in a switch cabinet or a housing with IP54/NEMA 3 protection or better (required by EN IEC 61496-1)?

17.2 After installation

- Has the start-up enable contact (RESTART) been connected? (Only in conjunction with start-up/restart interlock.)
- Has the fault enable contact (RESET) been connected? (If required.)
- Is there a red and a green indicator light at a suitable position for indicating the status of the outputs, or has the prescribed red/green indicator light been implemented in some other way?
- With start-up/restart interlock: Is there a yellow indicator light fitted in a clearly visible position to signal start-up readiness?
- With muting: Is there a suitable muting indicator fitted in a clearly visible position to signal when muting is active?
- Have all required light barriers, muting sensors and external 2-channel emergency cut-out devices been connected correctly?
- Have the light barriers and muting sensors (if present) been arranged in such a way that no one can reach the danger point by bypassing the light barrier?
- Have the light barriers been properly adjusted?

17.3 Start-up

- After installation of the safety device, have you tested its detection capability at each beam? (For size of the obstruction see light barrier data.)
- Have you checked the function of the start-up/restart interlock (RESTART, if activated)?
- Have you checked the monitoring function for external contacts (if activated)?
- Have you checked the muting function (if present)?
- Have you checked if the SC4-8 responds correctly to the signals of connected emergency stop devices?

17.4 Periodic Testing

- Is the protection zone interrupted or the system switched on at least once every day of operation?
- Is the response time checked in cyclic intervals?
- Is an inspection of the safety equipment done in prescribed intervals?
- Is there a documentation of the realized check-ups?

18 Technical Data

18.1 General specifications

Approvals	TÜV, cNRTLus
Tests	EN IEC 61496; EN ISO 13849; EN 55022 The specified standards refer on the respective current version of the normative documents
Safety type	4 (EN IEC 61496)
Performance Level	PL e (EN ISO 13849)
Safety Integrity Level (SIL)	SIL 3 (EN IEC 61508)
Category	Cat. 4 (EN ISO 13849)
Marking	CE

Tabelle 18.1:

18.2 Electrical specifications

Supply voltage:	
230 V-design:	230 V AC (-15%, +10%), 48 Hz ... 62 Hz
115 V-design:	115 V AC (-15%, +10%), 48 Hz ... 62 Hz
24 VAC-design:	24 V AC (-10%, +10%)
24 VDC-design:	24 V DC (-25%, +25%)
Current consumption:	
230 V-design:	≤ 50 mA
115 V-design:	≤ 100 mA
24 V AC or 24 V DC-design:	≤ 500 mA
Power consumption:	
230 V-design:	13 W
115 V-design:	13 W
24 V AC or 24 V DC-design:	15 W
Rating:	
230 V-design:	II (IEC 61140)
115 V-design:	II (IEC 61140)
24 V AC or 24 V DC-design:	III (IEC 61140)
Response time:	
With relay outputs:	40 ms
With solid state outputs:	10 ms
Timing:	
Release time after protective beams became free:	115 ms
Delay between activation of muting sensors and muting enable:	115 ms
Delay between deactivation of muting sensors and muting disable:	10 ms
Actuation current and voltage for potential separating control contacts:	8 mA/24 V DC

Table 18.2: Electrical Data

*) absolute safe separation up to 300 V to all other terminals

Actuation time for start-up enable (Restart) and fault enable (Reset):	0.05 s ... 1 s
Outputs OSSD 1 and OSSD 2, isolated relays outputs at clamps 36 to 41:	
Switching voltage AC/DC:	20 V ... 230 V AC/DC
Switching current AC:	0.01 A ... 2 A
Switching current DC:	see limit curve
Switching rate:	max. 1/s
fusing	fuse T2A
Output for indicator "OSSD", isolated relays outputs at clamps 42-44:	
Switching voltage AC/DC:	20 V ... 230 V AC/DC
Switching current AC:	0.02 A ... 2 A
Switching current DC:	see limit curve
fusing	unused
Output for indicator "READY", isolated relays outputs at clamps 45-46:	
Switching voltage: AC/DC	20 V ... 230 V AC/DC
Switching current AC:	0.02 A ... 2 A
Switching current DC:	see limit curve
fusing	unused
Output for indicator "MUTING", isolated relays outputs at clamps 47-48:	
Switching voltage AC/DC:	20V ... 230 V AC/DC
Switching current AC:	0.05 A ... 0.5 A
Switching current DC:	see limit curve
fusing	fuse 1TA
Attention	ensure correct polarity for DC operation (+ at clamp 47, - at clamp 48)
Output for indicator "ALARM" or "FOULING", isolated relays outputs at clamps 29-30:	
Switching voltage:	20 V ... 48 V DC
Switching current:	1 mA ... 500 mA
fusing	unused
Muting sensors:	
max. current consumption, without load	20 mA
current consumption of inputs	10 mA

Table 18.2: Electrical Data

18.3 Mechanical data

Wiring:	
Connection	terminal clamps with terminal screws
conductor cross section	litz wire with sleeve, max1.5 mm ²
Ambient conditions:	
Operating temperature:	0 °C ... 50 °C
Storage temperature:	-20 °C ... 75 °C
rel. humidity, uncondensed	max. 95% at temperature from 20 °C to 50 °C
Weight:	
115 V AC or 230 V AC version	1300 g
24 V AC or 24 V DC version	750 g
Housing material:	
Polycarbonate/V-0	
Rating:	
IP 20 / NEMA 1	
Attention	mounting in a switch cabinet or enclosure with rating IP54 / NEMA 3 or better is demanded
Length of cord sets:	
between control unit and light switch	max. 50 m
others	max. 100 m

Table 18.3: Mechanical data

Limit curve with DC current

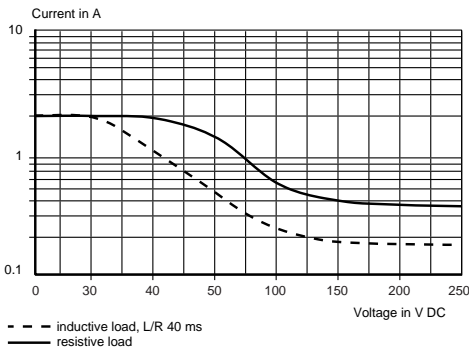


Figure 18.1: Limit curve

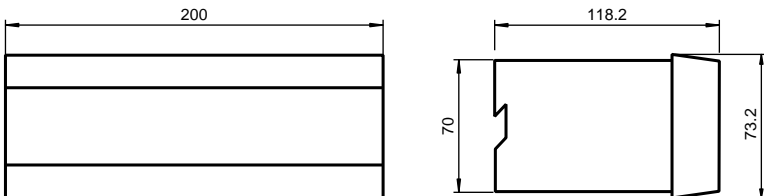


Figure 18.2: Dimensions

18.4 Light Barrier Types

Type SLA and SLP single-path light barriers form, together with the SC4-8 control unit, an electro-sensitive protective device in category 4 (EN 954-1) or of type 4 (IEC 61496-1). Between 1 and 8 light barriers can be connected to a single control unit.

Various types of light barriers can be combined as required, although each light barrier must consist of a transmitter and receiver of the same type. Operating the light barriers is only permitted in conjunction with an SC4-8-family control unit.

The various light barriers which can be connected to the SC4-8 control unit have varying types of connection. The light barriers have either a fixed cable connection, a plug-in connection or a terminal space is provided to connect the cable. Light grids SLP 10 to SLP 65 are suitable for use as access protection devices with 2 to 8 beams of light. (The distances between the light beams correspond to the requirements of the EN 999 standard.)

For the wiring between the control unit and the light grid's transmitter or receiver, please refer to the data sheet that came with your SC4-8 control unit.

18.5 Path Folding Mirror

It is possible to use path folding mirrors to achieve protection along several sides of an area. The mirrors deflect the beam of light through 90°. They should be arranged and aligned accordingly.

Mirrors reduce the range of the light barriers by approximately 10 % ... 20% per mirror.

19 Standards

The relevant laws and standards apply to the use of photoelectric protective devices. There are differences depending on the area of use. The following regulations are relevant within the EU and Germany.

19.1 Construction and equipping of protective equipment

IEC 61496-1	Safety of machinery. Electro-sensitive protective equipment
IEC 61508,	Functional safety of EPE safety-related systems
DIN V VDE0801	Principles for computers in systems with safety tasks
DIN EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems

19.2 Use and installation of protective equipment

IEC 50178	Electronic equipment for use in power installations
DIN IEC 68	Electrical engineering; basic environmental testing procedures
DIN EN 60204-1	Safety of machinery - electrical equipment of machines
DIN EN 61140	Protection against electric shock - common aspects for installations and equipment (IEC 61140:2001 and A1:2004, modified)
DIN EN 60664-1	Coordination of the insulation of electronic equipment in low-voltage systems - Part 1: Principles, requirements and tests (IEC 60664-1:2007)
DIN EN 60068-1:1995-03	Environmental testing - Part 1: General matters and guidance
Directive 98/37/EC, from 29.12.2009 Directive 2006/42/EC	Machinery Directive
EN ISO 12100	Safety of machinery - electrical equipment of industrial machines
EN ISO 13849-1	Safety of machinery - safety relevant parts of controls- part 1: General design principles
DIN CLC/TS 62046, preliminary standard, 2005-09	Safety of machinery - Use of protective equipment to recognize the presence of people (IEC/TS 62046:2004) Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
EN999/EN ISO 13855	Safety of machinery - The positioning of protective equipment with respect to approach speeds of parts of the human body
ZH1/597	Safety rules for non-contact protective equipment on powered equipment
EN ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs

In addition to the stipulations listed there may be other applicable standards for special machinery and applications that should be considered.



20 Data sheet: Example

Visolux, branch of the
Pepperl+Fuchs GmbH
Division Safety

Configuration data sheet for Ident numbers:
SC4-8

1.600 0001
99999901

Official in charge: Burton Date: 03.27.1999

	n.c. IN4	33	54	24 V	relay feedback (normally closed)
	n.c. 24 V	32	53	IN3	relay feedback (normally closed)
	n.c. GND	31	52	24 V	start-up enable (normally closed)
	on = Fault indication OUT3	30	51	IN2	start-up enable (normally closed)
	on = Fault indication OUT3	29	50	24 V	Reset (normally closed)
	-Ub magnet sensor 2 GND	28	49	IN1	Reset
	n.c. T8	27	48	OUT2 - or AC	Muting lamp
	Output magnet sensor 2 R8	26	47	OUT2 + or AC	Muting lamp
	+Ub magnet sensor 1 and 2 24 V	25	46	OUT1	Ready for start-up
	Output magnet sensor 1 R7	24	45	OUT1	Ready for start-up
	n.c. T7	23	44	OSSD-display rd	
	-Ub magnet sensor 1 GND	22	43	OSSD-display gn	
SLA 20-S, SLA20-E, connector 3 GND		21	42	OSSD-display common	
SLA 20-S, connector 2 T6		20	41	OSSD2 normally closed	
SLA20-E, connector 4 R6		19	40	OSSD2 normally open	
SLA20-E, connector 1 24 V		18	39	OSSD2 common	
SLA20-E, connector 4 R5		17	38	OSSD1 normally closed	
SLA 20-S, connector 2 T5		16	37	OSSD1 normally open	
SLA 20-S, SLA 20-E, connector 3 GND		15	36	OSSD1 common	
-Ub SLP 8-2 A (unit 2) GND		14	35	Power	24 V AC or DC
T1 SLP 8-2A (unit 2) T4		13	34	Power	24 V AC or DC
R1 SLP 8-2A (unit 2) R4		12			
+Ub SLP 8-2A (unit 1 and 2) 24 V		11			
R1 SLP 8-2A (unit 1) R3		10			
T1 SLP 8-2A (unit 1) T3		9			
Ub SLP 8-2 A (unit 1) GND		8			
n.c. GND		7			
n.c. T2		6			
Emergency stop channel B, connector 1 R2		5			
Emergency stop A and B, connector 2 24 V		4			
Emergency stop channel A, connector 1 R1		3			
n.c. T1		2			
n.c. GND		1			

Muting mode		Timing Parameters	
Time window limited	<input type="checkbox"/>	Muting time window	240 s
Protection beam limited	<input checked="" type="checkbox"/>	Simultaneity window	2s
Sequence control on channels 3-5		Emergency muting window	4s
sequence: 345	<input type="checkbox"/>	Time from safety area clearance until finishing protection beam limited muting	1...2 s
sequence: 345	<input type="checkbox"/>	Reaction time prolongation of channels	0
sequence: 345 & 543	<input type="checkbox"/>	Time limit for external contact monitoring	190 ms
Sequence control on channels 6-8		Time delay for pre-fault alarm	-
sequence: 678	<input type="checkbox"/>	Deactivation delay for the selected channels	8 s
sequence: 876	<input type="checkbox"/>		
sequence: 678 & 876	<input type="checkbox"/>		

Muting channels with deactivation delay			
5	6	7	8
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Channel pairs with simultaneity			
1,2	3,4	5,6	7,8
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Muting conditions																
	Muting channels								influenced channels							
	5	6	7	8	1	2	3	4	5	6	7	8				
1.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

others	
Start-up/restart-interlock	<input checked="" type="checkbox"/>
Contact monitoring	<input checked="" type="checkbox"/>

20

Certain data are required in order to define the functions of the SC4-8. This example illustrates the data required for the data sheet.

Customer Number:	99999
Company:	Sample Ltd.
Department:	Assembly
Town:	Nowhere
Street:	999 Main Street
Title of contact:	graduate engineer
Name of contact:	Burton
Phone number:	1234567890

Ident number	Additional Ident number	Project name
1.600 0001	99999901	Safeguarding of a textile cutting machine

Application description:

A textile cutting machine is surrounded by an enclosure fence, which has passages at 2 places. Each of these passages has to be safeguarded by 2 safety light barriers. The passages are for material feeding and purging and must be bridgeable therefore.

At one side a material feeding palette transporter drives into the safeguarded area. By interrupting the crossed protection beams (channel 5 and 6) it triggers muting. After discharging the palette transporter it leaves the safeguarded area in the same way.

On the other side an empty palette transporter enters the safeguarded area. It moves beneath the lowest beam and needs no muting. After it is loaded automatically, it leaves the dangerous area whereby it interrupts the protection beams of the safety light barrier. To steer clear from process interruption, magnet sensors shall trigger muting previously. The magnet sensors are to be mounted only inside the dangerous area. The distance between the magnet sensors and the protection field is 0.5 meters. The length of the palette transporter is 2 meters and its velocity is 0.5 m/s. According to these data, the deactivation delay of the magnet sensors is adjusted so that the palette transporter can pass the protection field, without causing any malfunction.

In addition a 2-channel emergency-stop device is connected.

Appearing system errors shall be displayed by an output contact.

The 2 relays, which commutate the main drive according to the output state of the safety device, shall be monitored for correct operation.

Degree of Danger (safety category according to EN ISO 13849): 4

Responsible admission office:

Sensor channel	Function	Sensor type	OSSD
1	Emergency-stop	Contact n. c. between R and +24 V	constrained relay
2	Emergency-stop	Contact n. c. between R and +24 V	Supply voltage
3	Protection beam	Light barrier SLA or SLP	24 V AC/DC
4	Protection beam	Light barrier SLA or SLP	Start-up/Restart interlock
5	Muting sensor	Light barrier SLA or SLP	Ext. contact monitoring
6	Muting sensor	Light barrier SLA or SLP	
7	Muting sensor	PNP or contact to +24 V, active ON	
8	Muting sensor	PNP or contact to +24 V, active ON	
Muting channels		influenced channels	channel pairs with simultaneity
	5 6 7 8	1 2 3 4 5 6 7 8	1-2 3-4 5-6 7-8
Muting condition 1	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input checked="" type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
Muting condition 2	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Deactivation delay	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>		Deactivation delay time: 8 s



21 Notes

With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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